

**REMARKS**

The application was filed with claims 1-44. Claims 1-44 and 54-67 were canceled by previous amendment. Claims 68 and 69 were added by previous amendment. Claims 46 and 68-69 have been canceled herein. New claims 70-82 have been added herein. Therefore, claims 45, 47-53, and 70-82 are pending. Claim 45 has been amended herein.

***Supplemental Information Disclosure Statement***

Enclosed herewith is a Supplemental Information Disclosure Statement with PTO Form-1449. Consideration of the information cited therein and indication of same is respectfully requested.

***Claim Amendments***

Claim 45 has been amended herein to recite, *inter alia*, “a gallic acid content of less than about 1.0 parts by weight (pbw).” No new matter has been added by this amendment. Support for these amendments can be found throughout the specification, as filed, and specifically at, *inter alia*, page 6, line 24 of the specification, as filed.

***New Claims***

New claims 70-79 further define the claimed aqueous treating compositions. Claim 70, and those claims depending therefrom, recite, *inter alia*, “A two-part aqueous treatment comprising: a. a first aqueous treating composition comprising tannic acid; and b. a second topical treating composition comprising a fluorochemical.” No new matter has been added by the new claims. Support for these claims can be found throughout the specification, as filed, for example at pages 17-19 and 29, and specifically in the original claims.

Claims 80-82 are directed to a fiber, yarn or carpet comprising tannic acid and a topically applied fluorochemical. No new matter has been added by the new claims. Support for these claims can be found throughout the specification, as filed, for example at pages 17-19, and 29 and in Tables 4, 6, 8, and 10.

***Other Amendments***

Please amend the Attorney Docket No. to 03269.0109U1.

***Arguments made in Office Action***

While the Office Action concedes that the cited references are silent with respect to the gallic acid content of the tannic acid components (*see* Office Action mailed June 13, 2006 at page 3) and, therefore, cannot anticipate the pending claims, the Office Action alleges that the pending claims are obvious over the cited references for essentially three reasons:

First, the Office Action contends that “since gallic acid is acquired by the hydrolysis of tannic acid it would have been within the level of the skilled artisan to arrive at the gallic acid content absent a showing to the contrary.” *See* Office Action mailed June 13, 2006 at page 3.

This argument is factually incorrect in that the hydrolysis of tannic acid to produce gallic acid would instead increase the amount of gallic acid present in the composition rather than to provide the claimed compositions having the recited low levels of gallic acid. In fact, the skilled artisan knowing that the hydrolysis of tannic acid produces gallic acid actually teaches away from selecting the low levels of gallic acid (*i.e.*, “less than about 1.0 parts by weight”) recited in claim 44 and those claims depending therefrom.

Second, the Office Action contends that “it is well known to the skilled artisan to optimize percentages . . . [and] by stating that any commercially available tannic acid can be used is a reasonable assumption that tannic acids of a range of gallic acid contents could be employed in a beneficial or synergistic manner” (*see* Office Action mailed June 13, 2006 at page 3) and concludes that the claims are obvious. In support of this argument, the Office Action cites *In re Peterson*, 315 F.3d 1325, 1330, 65 USPQ2d 1379, 1382 (Fed. Cir. 2003) (“The normal desire of scientists or artisans to improve upon what is already generally known provides the motivation to determine where in a disclosed set of percentage ranges is the optimum combination of percentages.”) (A copy is attached hereto as Exhibit A).

In *Peterson*, the claimed invention concerned “[a] nickel-base superalloy . . . consisting essentially of about 1 to 3 percent rhenium [and] about 14 percent chromium.” *In re Peterson*, 315 F.3d at 1327. The Examiner had rejected the claim as obvious in view of the Shah reference, which disclosed “very broad ranges for rhenium (0-7%) and chromium (3-18%).” *Id.* at 1328. The Court upheld the rejection and held that “selecting a narrow range from within a somewhat broader range disclosed in a prior art reference is no less obvious than identifying a range that simply overlaps a disclosed range.” *Id.* at 1330 (emphasis added). In this case, the prior art taught that the alloy could consist essential of rhenium and chromium and set forth somewhat broader ranges (0-7% and 3-18%, respectively) for the rhenium and chromium content.

In contrast, in *In re Antonie*, 559 F.2d 618, 195 USPQ 6 (CCPA 1977) (A copy is attached hereto as Exhibit B), the claimed invention concerned a wastewater treatment device with a ratio of tank volume to contactor area of 0.12 gal./sq. ft., the optimum value in that it maximizes “treatment capacity” so that the effectiveness of a given contactor is maximized. The Examiner had rejected the claim as obvious in view of the El-Naggar reference, which disclosed the basic device in question, but failed to teach a ratio of tank volume to contactor area. The Court explained:

While the ratio of tank volume to contactor area of 0.12 gal./sq. ft. is not disclosed in El-Naggar, the examiner reasoned that the disclosure of El-Naggar would make a device with that optimum value obvious. The examiner noted that El-Naggar suggests increasing the “efficiency” (degree of purification) of his device by increasing the contactor area while apparently keeping the “throughput” constant, that is, reducing the “hydraulic loading.” The examiner then assumed that El-Naggar teaches keeping the tank volume constant while increasing the contactor area. Thus, the examiner argued that the idea of increasing tank volume to surface area to increase efficiency is taught and that working out the value for optimum efficiency is mere mechanical experimentation. The board accepted the examiner's reasoning.

*In re Antonie*, 559 F.2d at 619.

The Court reversed the board's decision, holding that "[i]t is impossible to recognize, from . . . El-Naggar, that 'treatment capacity' is a function of 'tank volume' or the tank volume-to-contactor area ratio. Recognition of this functionality is essential to the obviousness of conducting experiments to determine the value of the 'tank volume' ratio which will maximize treatment capacity." *Id.* at 620. Said another way, the prior art did not recognize that treatment capacity is a function of the tank volume to contractor ratio, and therefore the parameter optimized was not recognized in the art to be a result-effective variable.

In vain, the Patent Office then argued that it is within the level of the skilled artisan to vary every parameter in order to optimize a system:

The PTO and the minority appear to argue that it would always be obvious for one of ordinary skill in the art to try varying every parameter of a system in order to optimize the effectiveness of the system even if there is no evidence in the record that the prior art recognized that particular parameter affected the result. As we have said many times, obvious to try is not the standard of 35 USC 103. Disregard for the unobviousness of the results of "obvious to try" experiments disregards the "invention as a whole" concept of § 103 and overemphasis on the routine nature of the data gathering required to arrive at appellant's discovery, after its existence became expected, overlooks the last sentence of § 103.

*Id.* (internal citations omitted).

The Court rejected this argument and, therefore, it is long-established that only the optimization of a result-effective variable is *prima facie* obvious. See *In re Antonie*, 559 F.2d 618, 195 USPQ 6 (CCPA 1977). That is, the skilled artisan would not attempt to optimize a percentage if the artisan did not understand that there exists a relationship between the percentage and the desired result.

Accordingly the Office Action's argument is legally incorrect because the gallic acid content as a result-effective variable was unrecognized until the instant application's disclosure. Here – analogous to *Antonie* and distinct from *Peterson* – the cited references do not recognize that the amount of gallic acid in tannic acid can affect stain resistance, as recited in the instant

claims, and one of skill in the art would not have known that the gallic acid content could affect the properties of the claimed compositions. Therefore, the Office Action has not set forth a proper *prima facie* obviousness rejection, and the rejection must be withdrawn.

Third, the Office Action contends that applicant's Caustic 10 Total (Macbeth) . . . is not unexpected" (see Office Action mailed June 13, 2006 at page 4) and concludes that the claims are obvious.

This argument is factually incorrect in that the claimed compositions can be used to treat, e.g., a fiber, yarn or carpet and provide markedly improved resistance to discoloration, or "browning," which can be caused by contact of a treated fiber, yarn, or carpet with relatively high pH cleaning compositions. Nonetheless, in order to expedite prosecution, Applicants have amended the pending claims to recite compositions that more clearly demonstrate improved resistance to discoloration.

***Claim Rejections under 35 U.S.C. § 103***

The Office Action has rejected claims 45-50 and 52 under 35 U.S.C. § 103(a) as allegedly being unpatentable over U.S. Patent No. 5,738,688 to De Lathauwer (hereinafter "De Lathauwer"). The Office Action has also rejected claims 45-47 and 68-69 under 35 U.S.C. § 103(a) as allegedly being unpatentable over U.S. Patent No. 4,482,646 to Gamblin (hereinafter "Gamblin"). The Office Action has also rejected claims 45-47 and 68-69 under 35 U.S.C. § 103(a) as allegedly being unpatentable over U.S. Patent No. 4,094,701 to Fekete (hereinafter "Fekete"). The Office Action has also rejected claims 51 and 53 under 35 U.S.C. § 103(a) as allegedly being unpatentable over De Lathauwer in view of U.S. Patent No. 5,520,962 to Jones, Jr. (hereinafter "Jones").

Applicants respectfully disagree that the pending claims are obvious in view of the cited references. That is, amended independent claim 45 and claims 47-53 that depend therefrom recite, *inter alia*, tannic acid having a gallic acid content of less than about 1.0 parts by weight, which is not taught or suggested by De Lathauwer, Gamblin, Fekete, Jones, or any combination thereof. Likewise, new independent claim 70 and claims 71-79 that depend therefrom recite a

two-part aqueous treating composition comprising a first aqueous treating composition comprising tannic acid and a second topical treating composition comprising a fluorochemical, which is not taught or suggested by De Lathauwer, Gamblin, Fekete, Jones, or any combination thereof.

- **The Office Action fails to establish a *prima facie* case of obviousness for claims 45 and 47-53**

To the extent that the Office alleges that the combination of a tannic acid and a fluorochemical would be rendered obvious by De Lathauwer, Gamblin, Fekete, Jones, or any combination thereof, *see* Office Action mailed June 16, 2006 at pages 2-3, the Office fails to set forth a proper *prima facie* obviousness rejection.

As explained fully in the Arguments made in Office Action section, *supra*, only the optimization of a result-effective variable is *prima facie* obvious. *In re Antonie*, 559 F.2d 618, 195 USPQ 6 (CCPA 1977). Neither De Lathauwer nor Gamblin nor Fekete nor Jones nor any combination thereof recognized that the gallic acid content in tannic acid can affect the stain resistance properties of, *e.g.*, fiber, yarn or carpet treated with the claimed compositions, much less that a gallic acid content of less than about 1.0 parts by weight can significantly improve the stain resistance properties of, *e.g.*, fiber, yarn or carpet treated with the claimed compositions. Accordingly, one of skill in the art would not have known that the gallic acid content could affect the properties of the claimed compositions; therefore, the Office Action has not set forth a proper *prima facie* obviousness rejection, and the rejection must be withdrawn.

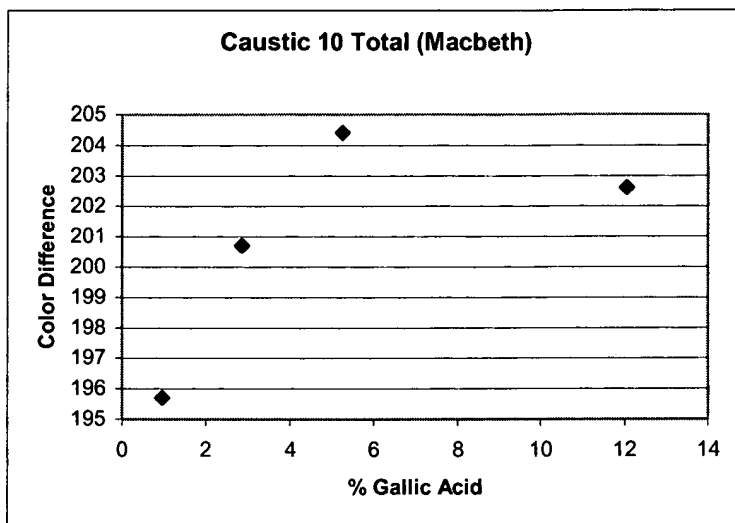
Moreover, even if the Office Action had properly set forth a *prima facie* obviousness rejection of any of the current claims for, *which it did not*, Applicants' specification provided disclosures and data on unexpectedly superior properties associated with the currently claimed compositions that would be sufficient to overcome any such *prima facie* rejection. In particular, the currently pending application teaches, *inter alia*, that the methods of the present invention provide markedly improved resistance to discoloration, or "browning," which can occur frequently during routine maintenance of the treated fiber, yarn, or carpet with high pH cleaning

compositions. This can be evaluated, for example, by measuring the color difference in a treated fiber, yarn, or carpet before and after application of a 10% by weight sodium hydroxide solution (“Caustic 10”; *see* specification at page 30). The color difference can be evaluated by using a Macbeth contact spectrophotometer model 20/20 (“Macbeth”) or by using a visual gray scale rating system as described in ISO 105-A02 (“ISO 105-A02”). *See* specification at page 30.

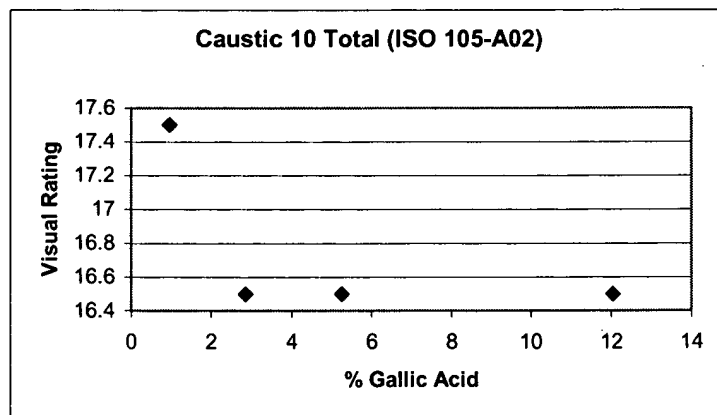
As described at page 31 of the specification, four tannic acids having differing gallic acid contents were evaluated. The “Caustic 10” test, using both the “Macbeth” and the “ISO 105-A02” measurement methods, was used to evaluate samples of treated fiber, yarn, or carpet, as set forth in Table 4 (page 38), Table 6 (page 41), Table 8 (page 44), and Table 10 (page 47) of the specification, as filed. Exemplary results are summarized below:

| <b>Tannic Acid</b>            | <b>% Gallic</b> | <b>Caustic 10<br/>(Macbeth)</b> | <b>Caustic 10<br/>(ISO 105-A02)</b> |
|-------------------------------|-----------------|---------------------------------|-------------------------------------|
| <b>ASP</b>                    | 0.96            | 195.7                           | 17.5                                |
| <b>3SP</b>                    | 2.87            | 200.7                           | 16.5                                |
| <b>CLM</b>                    | 5.26            | 204.4                           | 16.5                                |
| <b>BAYGARD®<br/>CL Liquid</b> | 12.05           | 202.6                           | 16.5                                |

A lower “Macbeth” measurement for the Caustic 10 test denotes that the samples have a smaller change in coloration (*i.e.*, less “browning”) due to exposure to a 10% by weight sodium hydroxide solution; this indicates superior stain resistance. Close inspection of these results reveals that the color difference (“Macbeth”) between samples before and after contact with a 10% by weight sodium hydroxide solution is substantially and unexpectedly lower for samples treated with tannic acid having less than about 1% gallic acid, as shown in the graph below:



Likewise, a higher “ISO 105-A02” measurement for the Caustic 10 test denotes that the samples appear less “browened” after exposure to a 10% by weight sodium hydroxide solution; this indicates superior stain resistance. The visual rating (“ISO 105-A02”) for samples contacted with a 10% by weight sodium hydroxide solution is unexpectedly higher for samples treated with tannic acid having less than about 1% gallic acid, as shown in the graph below:



Thus, the substantially superior resistance to browning observed when using the claimed compositions to treat, *e.g.*, fiber, yarn or carpet indicates that the claimed compositions are not obvious over De Lathauwer, Gamblin, Fekete, Jones, or any combination thereof.



- **The cited references do not anticipate or establish a *prima facie* case of obviousness for claims 70-82**

New claims 70-82 are novel and non-obvious over De Lathauwer, Gamblin, Fekete, Jones, or any combination thereof.

- *The cited references do not teach or suggest all claim limitations*

First, the cited references do not teach or suggest each and every limitation of claim 70 or of claims 71-79 that depend therefrom. Specifically, neither De Lathauwer, nor Gamblin, nor Fekete, nor Jones, nor any combination thereof teaches or suggests a two-part aqueous treatment comprising a first aqueous treating composition comprising tannic acid and a second topical treating composition comprising a fluorochemical. Because this two-part combination is taught nowhere in the prior art, the claim cannot be anticipated or *prima facie* obvious.

Likewise, the cited references do not teach or suggest each and every limitation of claim 80 or of claims 81-82 that depend therefrom. A fiber, yarn or carpet comprising tannic acid and a topically applied fluorochemical is taught nowhere in the prior art and, thus, cannot be anticipated or *prima facie* obvious.

- *There is no suggestion or motivation to combine*

Second, neither De Lathauwer, nor Gamblin, nor Fekete, nor Jones provides a suggestion to so modify the disclosure of De Lathauwer. Specifically, although De Lathauwer arguably discloses a tannic acid for use as a stain resistance composition, De Lathauwer nowhere teaches or suggests the application of a second topical composition comprising a fluorochemical. Even if one or more of the cited references had taught or suggested the use of a fluorochemical in combination with a tannic acid treatment, *which it did not*, De Lathauwer nowhere teaches or suggests that the application of such a second topical composition is desirable.

Because motivation to modify the aqueous treating composition step of De Lathauwer to arrive at the instantly claimed methods of the pending claims is absent from De Lathauwer,

Gamblin, Fekete, and Jones, the Office Action has borrowed the requisite motivation from the disclosure of the instant application and, therefore, has engaged in impermissible hindsight reconstruction of the claimed invention. It is improper, in determining whether a person of ordinary skill would have been led to this combination of references, simply to “[use] that which the inventor taught against its teacher.” *In re Lee*, 277 F.3d 1338, 1343 (Fed. Cir. 2002). Hindsight reconstruction cannot support a proper *prima facie* rejection for obviousness.

○ *There is no reasonable expectation of success*

Third, the cited references do not supply a reasonable expectation of success in arriving at the claimed invention, upon making the allegedly suggested combination. De Lathauwer, Gamblin, Fekete, Jones, and the Office Action all fail to provide any support for reasonable chance of success. At best, even an unsupported reference to “the art as a whole” can be used as evidence that it would be obvious to try a second topical fluorochemical composition in combination with a first tannic acid composition. However, as noted in MPEP § 2145, “obvious to try” is an improper standard under 35 USC § 103. This situation is analogous to the situation described by the *In re O’Farrell* court. Specifically, the court stated that:

In some cases, what would have been “obvious to try” would have been to vary all parameters or try each of numerous possible choices until one possibly arrived at a successful result, where the prior art gave either no indication of which parameters were critical or no direction as to which of many possible choices is likely to be successful.... In others, what was “obvious to try” was to explore a new technology or general approach that seemed to be a promising field of experimentation, where the prior art gave only general guidance as to the particular form of the claimed invention or how to achieve it.

*In re O’Farrell*, 853 F.2d 894, 903 (Fed. Cir. 1988).

Said another way, two references simply being “in analogous arts” is insufficient to provide any expectation of successful combination – much less a reasonable expectation – in the complete absence of any indication that the combination could provide an improvement or that the combination would be likely to be successful in providing that improvement.

- *Any alleged obviousness is rebutted by unexpectedly superior results*

Even if *arguendo* the Office could properly support a *prima facie* rejection of any of claims 70-82 for obviousness, *which it cannot*, Applicants' specification provided disclosures and data on unexpectedly superior properties associated with the currently claimed compositions that would be sufficient to overcome any such *prima facie* rejection. In particular, the currently pending application teaches, *inter alia*, that unexpectedly substantially superior stain resistance (for both total stain and for caustic) is achieved when using a two-part aqueous treatment comprising a first aqueous treating composition comprising tannic acid and a second topical treating composition comprising a fluorochemical. In the same way, the application teaches, *inter alia*, the unexpectedly substantially superior stain resistance of a fiber, yarn or carpet comprising tannic acid and a topically applied fluorochemical (*e.g.*, a fiber, yarn or carpet treated with a two-part aqueous treatment comprising a first aqueous treating composition comprising tannic acid and a second topical treating composition comprising a fluorochemical).

Review of the results from the Examples shows that the treatments of claims 70-79 and the fiber, yarn or carpet of claims 80-82 provide an improved Caustic 10% measurement (a lower number translates to decreased "browning") as well as an improved Total Stain measurement (a lower number translates to improved resistance to staining in general). A summary of data from Tables 3-10 (*see* pages 37-47 of the specification as filed) is tabulated in Table I below:

**Table**

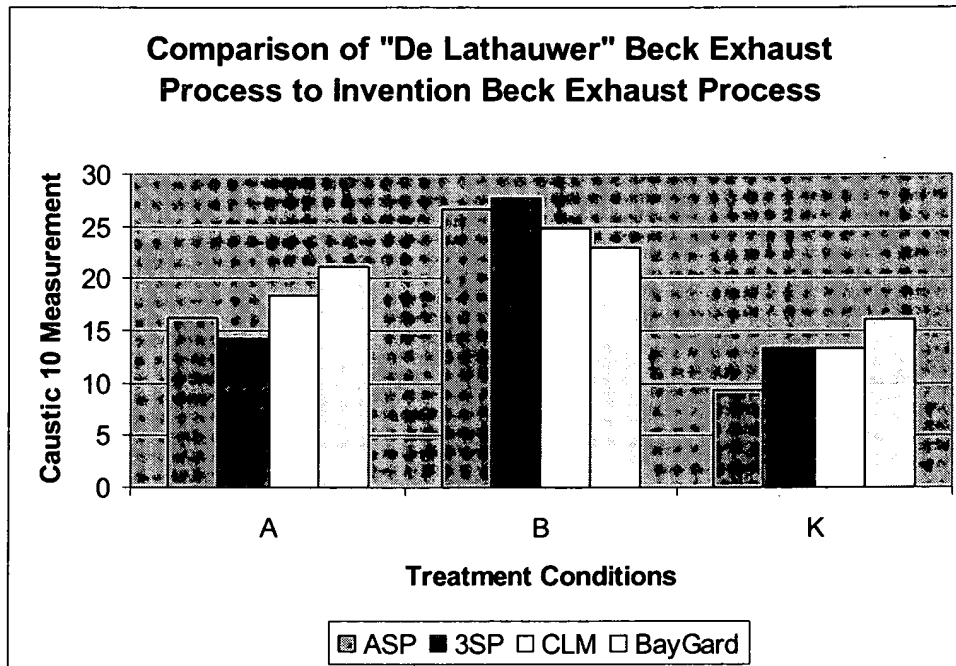
| Sample Conditions |   | ASP (0.96%) <sup>1</sup><br>Table 4, p.38 |       | 3SP (2.87%) <sup>2</sup><br>Table 6, p.41 |       | CLM (5.26%) <sup>3</sup><br>Table 8, p.44 |       | BayGard CL<br>(12.05%) <sup>4</sup><br>Table 10, p.47 |       |
|-------------------|---|---|-------|---|-------|---|-------|---|-------|
|                   |   | Caustic                                   | Total | Caustic                                   | Total | Caustic                                   | Total | Caustic   | Total |
| A                 | Beck Exhaust (De Lathauwer)                                   | 16.2                                      | 104.9 | 14.2                                      | 76    | 18.3                                      | 104.8 | 21.1  | 80.5  |
| B                 | Beck Exhaust (De Lathauwer)<br>plus fluorochemical in bath    | 26.6                                      | 133.1 | 27.7                                      | 121.8 | 24.8                                      | 83.2  | 23  | 84.4  |
| C                 | Beck Exhaust (conventional SR)                                | 16.5                                      | 51.2  | 17  | 57.1  | 17.1                                      | 50.15 | 15.1  | 47.4  |
| D                 | Beck Exhaust (conventional SR)<br>plus fluorochemical in bath | 15.7                                      | 56.3  | 14.8                                      | 47.4  | 16  | 56.3  | 13.4  | 47.4  |
| E                 | Continuous (De Lathauwer)                                     | 16.4                                      | 108.4 | 15.5                                      | 107   | 20.9                                      | 94.5  | 22.4  | 104.8 |

|          |   |      |      |      |       |      |       |      |      |
|----------|---|------|------|------|-------|------|-------|------|------|
| <b>F</b> | Continuous (De Lathauwer)<br>plus Alum                                | 16.7 | 80.9 | 19.9 | 96.1  | 13.3 | 66.7  | 10.1 | 67.4 |
| <b>G</b> | Continuous (De Lathauwer)<br>plus fluorochemical in bath              | 16.2 | 90.1 | 16.4 | 87.5  | 16   | 71.3  | 21.9 | 84.9 |
| <b>H</b> | Continuous (De Lathauwer)<br>plus fluorochemical in bath<br>plus Alum | 15.3 | 78.5 | 14.4 | 82.4  | 11.7 | 67.8  | 11.5 | 67.1 |
| <b>I</b> | Continuous (conventional SR)  | 18.9 | 93.2 | 13.1 | 82.4  | 15.5 | 89.9  | 17.5 | 99.1 |
| <b>J</b> | Continuous (conventional SR)<br>plus fluorochemical in bath           | 21.7 | 52.6 | 21.7 | 55.6  | 25.6 | 74.15 | 25.5 | 71.3 |
| <b>K</b> | Invention (Beck Exhaust)  | 9.4  | 31.3 | 13.3 | 45.5  | 13.3 | 46.2  | 16   | 47.8 |
| <b>L</b> | Invention (Continuous)  | 6.1  | 35.9 | 12.7 | 56.05 | 11.9 | 58.1  | 5.1  | 50.4 |

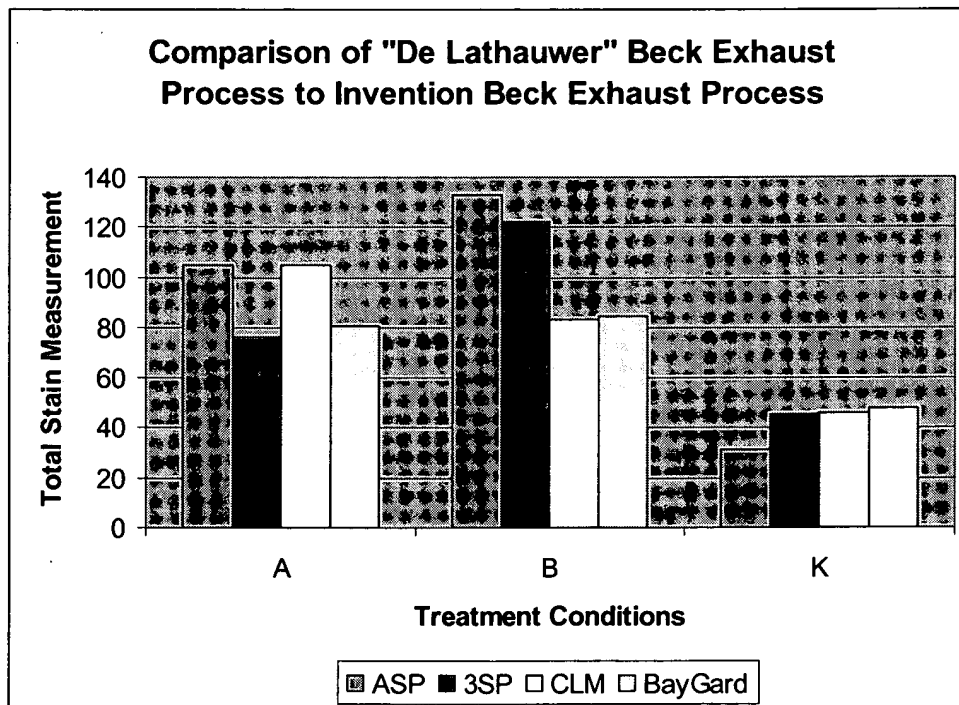
- <sup>1</sup>. Conditions for Samples A-L for ASP treated samples/controls are taken from Table 3, page 37.
- <sup>2</sup>. Conditions for Samples A-L for 3SP treated samples/controls are taken from Table 5, page 40.
- <sup>3</sup>. Conditions for Samples A-L for CLM treated samples/controls are taken from Table 7, page 43.
- <sup>4</sup>. Conditions for Samples A-L for BayGard CL treated samples/controls are taken from Table 9, page 46.

For example, comparison of a Beck Exhaust process and composition with treatment conditions analogous to those used in De Lathauwer (Table, entry A and Graph I, columns A) with a Beck Exhaust process and composition with treatment conditions as claimed in the present invention (Table, entry K and Graph I, columns K) demonstrates that the claimed compositions, when compared to conventional compositions (*e.g.*, those analogous to De Lathauwer) provide a substantially superior Caustic 10 measurement (here, as much as about, *e.g.*, 42% lower).

Graph I



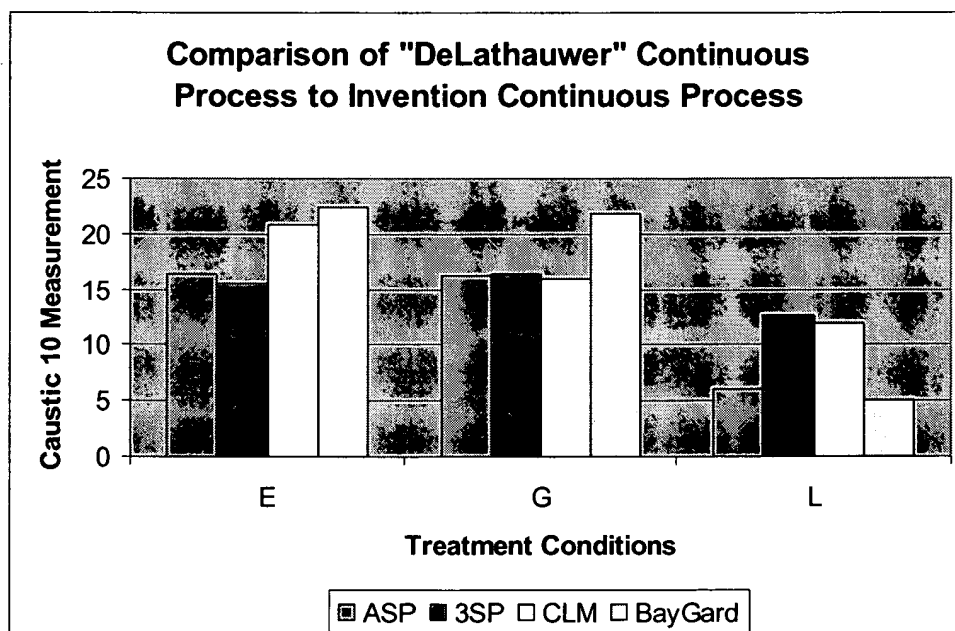
Graph II



Likewise, comparison of a Beck Exhaust process and composition with treatment conditions analogous to those used in De Lathauwer (Table, entry A and Graph II, columns A) with a Beck Exhaust process and composition with treatment conditions as claimed in the present invention (Table, entry K and Graph II, columns K) demonstrates that the claimed compositions, when compared to conventional compositions (*e.g.*, those analogous to De Lathauwer) provides a substantially superior total stain measurement (here, as much as about, *e.g.*, 70% lower).

Such improvement is also evident for the claimed compositions in a continuous process. Comparison of a continuous process with treatment conditions analogous to those used in De Lathauwer (Table, entry E and Graph III, columns E) with a continuous process with treatment conditions as claimed in the present invention (Table, entry L and Graph III, columns L) demonstrates that the claimed compositions, when compared to conventional compositions (*e.g.*, those analogous to De Lathauwer) provide a substantially superior caustic 10 measurement (here, as much as about, *e.g.*, 63% lower).

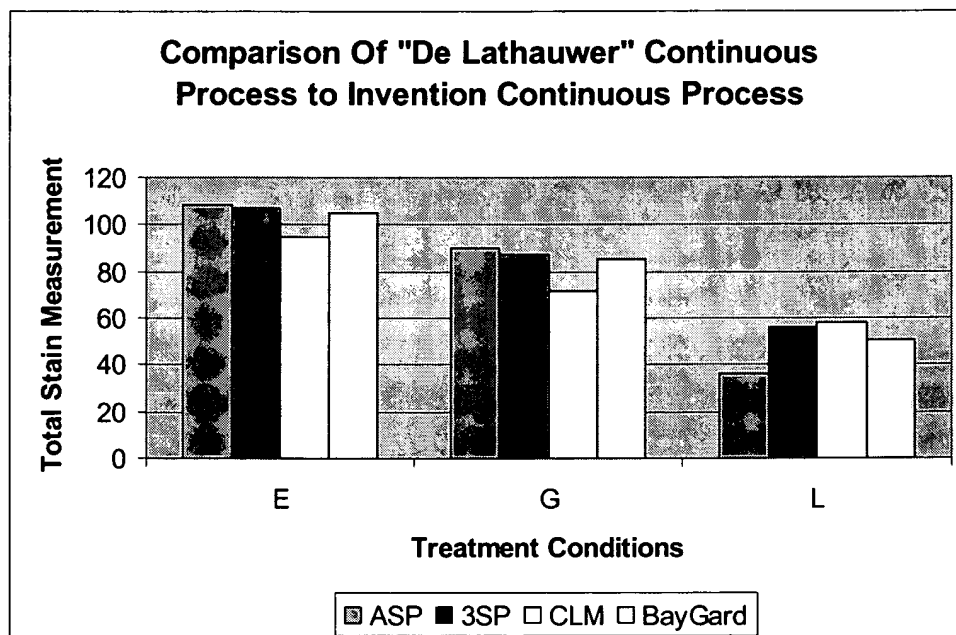
**Graph III**



Again, this improvement is also evident for the claimed compositions for total stain measurement in a continuous process. Comparison of a continuous process with treatment

conditions analogous to those used in De Lathauwer (Table, entry E and Graph IV, columns E) with a continuous process with treatment conditions as claimed in the present invention (Table, entry L and Graph IV, columns L) demonstrates that the claimed compositions, when compared to conventional compositions (*e.g.*, those analogous to De Lathauwer) provide a substantially superior total stain measurement (here, as much as about, *e.g.*, 67% lower).

Graph IV



No such improved stain resistance is disclosed anywhere in De Lathauwer, Gamblin, Fekete, or Jones. Accordingly, Applicants disclosures and examples of improved results for the claimed compositions would overcome any *prima facie* rejection for obviousness.

- **The alleged combination would not achieve the invention's superior results**

Even if one of skill in the art were motivated to combine the disclosures of two or more of De Lathauwer, Gamblin, Fekete, or Jones, *which one would not be*, the alleged combination would not provide the substantially superior results that are provided by the claimed method. More specifically, the simple combination of an aqueous tannic acid composition (De

Lathauwer) with a fluorochemical does not result in an improved composition for treating fiber, yarn or carpet, as claimed.

For example, comparison of a Beck Exhaust process with treatment conditions analogous to those used in De Lathauwer, but with added fluorochemical (Table, entry B and Graphs I and II, columns B) with a Beck Exhaust process with treatment conditions as claimed in the present invention (Table, entry K and Graphs I and II, columns K) demonstrates that the claimed compositions, when compared to conventional compositions (*e.g.*, those analogous to De Lathauwer), *even with added fluorochemical*, provides both substantially superior caustic 10 measurement and substantially superior total stain measurement. In fact, in some samples (*see, e.g.*, Graph I, columns B, all samples; Graph II, columns B, ASP and 3SP samples), the addition of a fluorochemical to a “De Lathauwer” treatment actually worsened stain resistance.

In the same way, comparison of a continuous process with treatment conditions analogous to those used in De Lathauwer, but with added fluorochemical (Table, entry G and Graphs III and IV, columns G) with a continuous process with treatment conditions as claimed in the present invention (Table, entry L and Graphs III and IV, columns L) demonstrates that the claimed compositions, when compared to conventional compositions (*e.g.*, those analogous to De Lathauwer), *even with added fluorochemical*, provide both substantially superior caustic 10 measurement and substantially superior total stain measurement.

Therefore, in view of the data presented in the Table and Graphs I-IV, any such obviousness rejection of new claims 70-79 would be overcome, necessitating withdrawal.



**CONCLUSION**

In light of the above arguments and amendments, the claims are believed to be allowable, and Applicant respectfully requests notification of same. The Examiner is invited and encouraged to directly contact the undersigned if such contact may enhance the efficient prosecution of the application to issuance.

A three-month shortened statutory period was set for response, nominally ending September 13, 2006. Therefore, this paper is timely. Payment in the amount of \$840.00, (reflecting the \$790.00 fee for the Request for Continued Examination and the \$50.00 fee for 1 total claim in excess of twenty), is enclosed herewith. The payment is to be charged to a credit card and is authorized by the signed, enclosed document entitled: Credit Card Payment Form PTO-2038. No further fee is believed due. However, the Commissioner is hereby authorized to charge any fees that may be required or credit any overpayment to Deposit Account No. 14-0629.

Respectfully submitted,

NEEDLE & ROSENBERG, P.C.



D. Brian Shortell, J.D., Ph.D.

Registration No. 56,020

NEEDLE & ROSENBERG, P.C.

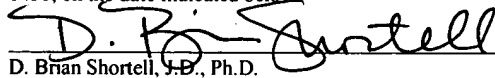
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(678) 420-9300 Phone

(678) 420-9301 Fax

**CERTIFICATE OF MAILING UNDER 37 C.F.R. § 1.8**

I hereby certify that this correspondence, including any items indicated as attached or included, is being deposited with the United States Postal Service as first class mail in an envelope addressed to: MAIL STOP RCE, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on the date indicated below.

  
D. Brian Shortell, J.D., Ph.D.

Sept. 5, 2006  
Date

# EXHIBIT A

LEXSEE 315 F3D 1330

IN RE LANCE G. PETERSON and IOANNIS VASATIS

02-1129, (Serial no. 08/365,392)

UNITED STATES COURT OF APPEALS FOR THE FEDERAL CIRCUIT

*315 F.3d 1325; 2003 U.S. App. LEXIS 233; 65 U.S.P.Q.2D (BNA) 1379*

January 8, 2003, Decided

**PRIOR HISTORY:** [\*\*1] Appealed from: United States Patent and Trademark Office Board of Patent Appeals and Interferences.

reducing its hot corrosion resistance. Representative claim 5 recites:

**DISPOSITION:** AFFIRMED.

A nickel-base superalloy having special utility in the production of single crystal gas turbine engine blades consisting essentially of about 1 to 3 percent rhenium, about 14 percent chromium, about 9.5 percent cobalt, about 3.8 percent tungsten, about 2 percent tantalum, about 1.5 percent molybdenum, about 0.05 percent carbon, about 0.004 percent boron and, respectively, from about 3 to 4.8 percent aluminum, from about 4.8 percent to about 3 percent titanium, and balance substantially nickel.

**COUNSEL:** James T. Hosmer, Nixon & Vanderhye P.C., of Arlington, Virginia, argued for appellants. With him on the brief was Leonard C. Mitchard.

William LaMarca, Associate Solicitor, Office of the Director of the United States Patent and Trademark Office, of Arlington, Virginia, argued for the Director. With him on the brief were John M. Whealan, Solicitor, and Joseph Piccolo, Associate Solicitor.

**JUDGES:** Before LOURIE, BRYSON, and DYK, Circuit Judges.

**OPINIONBY:** LOURIE

(emphases added). Peterson and the Board considered that the other claims stand or fall with claim 5, and we will therefore consider only claim 5.

**OPINION:** [\*1326] LOURIE, Circuit Judge.

The examiner rejected claims 1-7 under 35 U.S.C. § 103 as obvious over the following prior art references: (1) [\*\*3] published European Patent Application 240,451 ("Shah"); (2) published European Patent Application 076,360 ("Wukusick") alone or in view of U.K. Patent 2,153,848 ("Duhl"); and (3) U.S. Patent 3,619,182 ("Bieber") in view of Wukusick. For each ground of rejection, the examiner found a prima facie case of obviousness based on the overlapping element ranges of the prior art compositions and the claimed composition. Peterson responded by arguing that his invention would not have been obvious because the prior art disclosed only the optional use of rhenium and did not suggest that controlled amounts of rhenium would result in advantageous mechanical properties. Peterson also pointed to the unexpected results achieved by his invention: namely, the increased stress rupture life resulting from the addition of a small amount of rhenium. The examiner rejected those arguments in a final office action, finding that Peterson had failed to

Lance G. Peterson and Ioannis Vasatis (collectively, "Peterson") appeal from the decision of the U.S. Patent and Trademark Office ("PTO") Board of Patent Appeals and Interferences affirming the rejection of claims 1-7 of U.S. Patent Application 08/365,392 as obvious under 35 U.S.C. § 103. Ex Parte Wood, Appeal No. 1998-0535, Paper No. 19 (B.P.A.I. Apr. 23, [\*1327] 2001). Because substantial evidence supports the Board's factual findings and the Board did not err in its conclusion of obviousness, we affirm.

#### BACKGROUND

On December 28, 1994, Mr. Peterson filed U. [\*\*2] S. Patent Application 08/365,392, which is directed to a nickel-base single-crystal superalloy used in the manufacture of industrial gas turbine engines exposed to high temperatures. The claimed composition includes a relatively small amount of rhenium and aims to improve a single-crystal alloy's mechanical strength without

show criticality of the selected amount of rhenium commensurate in scope with the claims.

The Board affirmed the examiner's rejection. First, the Board found that the disclosure of overlapping ranges in Shah, Wukusick, and Bieber each established a prima facie case of obviousness. With respect to the rejection based primarily on Wukusick, the Board determined that the claimed range of "about 14 percent chromium" encompassed Wukusick's teaching to use up to 12% chromium. Secondly, the Board found that Peterson had failed to show that the claimed alloy possesses properties that would have been considered unexpected by a person of ordinary skill in the art. Specifically, the Board found that Peterson had not compared the claimed invention with the closest prior art (Wukusick's Alloy 2) and had not shown that the claimed range of rhenium was critical to improving stress rupture life. Thus, the Board concluded that Peterson's evidence of nonobviousness did not outweigh the evidence of obviousness and affirmed the examiner's rejection of claims 1-7.

Peterson timely appealed. We have jurisdiction pursuant to 28 U.S.C. § 1295(a)(4)(A).

#### [\*1328] DISCUSSION

The ultimate determination whether an invention would have been obvious under 35 U.S.C. § 103 is a legal conclusion based on underlying findings of fact. *In re Kotzab*, 217 F.3d 1365, 1369, 55 USPQ2d 1313, 1316 (Fed. Cir. 2000). We [\*5] review the Board's legal conclusion of obviousness de novo and its underlying factual determinations for substantial evidence. *In re Gartside*, 203 F.3d 1305, 1316, 53 USPQ2d 1769, 1776 (Fed. Cir. 2000). Whether an invention has produced unexpected results and whether a reference teaches away from a claimed invention are questions of fact. *In re Mayne*, 104 F.3d 1339, 1343, 41 USPQ2d 1451, 1455 (Fed. Cir. 1997) (unexpected results); *Para-Ordnance Mfg. v. SGS Importers Int'l*, 73 F.3d 1085, 1088, 37 USPQ2d 1237, 1239 (Fed. Cir. 1995) (teaching away). Under the substantial evidence standard, we affirm the Board's factual determinations if they are based upon "such relevant evidence as a reasonable mind might accept as adequate to support a conclusion." *In re Gartside*, 203 F.3d at 1312, 53 USPQ at 1773 (quoting *Consolidated Edison Co. v. NLRB*, 305 U.S. 197, 217, 83 L. Ed. 126, 59 S. Ct. 206 (1938)).

On appeal, Peterson argues that the cited prior art does not establish a prima facie case of obviousness because it does not suggest the claimed combination of "about 1 to 3 percent rhenium" with "about [\*6] 14 percent chromium" to create an alloy having improved strength. As to the first ground of rejection, Peterson contends that a skilled artisan would not have assumed

from Shah that using the claimed amounts of rhenium and chromium would improve alloy strength because Shah defines very broad ranges for rhenium (0-7%) and chromium (3-18%), mentions rhenium only as an optional ingredient, and discloses a preferred alloy containing no rhenium. With respect to the second ground of rejection, Peterson asserts that the Board misconstrued the phrase "about 14 percent chromium" to include 12% chromium. Peterson also argues that Wukusick only discloses the optional use of rhenium and does not suggest the combined use of rhenium and chromium in the amounts claimed. As to the final ground of rejection, Peterson argues that Bieber does not mention rhenium as a component in its alloys and even warns that increasing the chromium content to improve corrosion resistance will have "catastrophic effects" on other properties.

Peterson alternatively argues that, even if a prima facie case of obviousness were established, the Board erred in determining that the evidence of nonobviousness was insufficient [\*7] to rebut the prima facie case. Peterson points out that the claimed invention was the first to achieve the combination of corrosion resistance and improved strength for nickel-base single-crystal superalloys. Peterson thus contends that the examiner and the Board failed to appreciate the criticality of and the unexpected results achieved by the claimed combination of about 1-3% rhenium with, among other elements, about 14% chromium. Peterson further argues that Wukusick and Bieber teach away from the claimed invention by warning that high chromium contents can adversely affect alloy strength.

The PTO responds that the Board correctly found that the claimed composition would have been obvious based on any one of the three grounds of rejection because Shah, Wukusick, and Bieber all disclose ranges of elements that overlap the claimed ranges. The PTO argues that the Board properly interpreted the phrase "about 14 percent chromium" to include Wukusick's 12% chromium because Example I in Peterson's application discloses a superalloy containing 12.03% chromium.

[\*1329] The PTO further responds that the Board correctly determined that Peterson failed to overcome the prima facie case of [\*8] obviousness. The PTO contends that substantial evidence supports the Board's findings that Wukusick does not teach away from the invention and that Peterson failed to show unexpected results. Specifically, the PTO points out that Peterson's specification shows improved performance in stress rupture life only for 2% rhenium, rather than for the full claimed range of about 1-3% rhenium, and that Peterson failed to compare his results with the closest prior art.

#### A. The Prima Facie Case of Obviousness

A prima facie case of obviousness typically exists when the ranges of a claimed composition overlap the ranges disclosed in the prior art. E.g., *In re Geisler*, 116 F.3d 1465, 1469, 43 USPQ2d 1362, 1365 (Fed. Cir. 1997); *In re Woodruff*, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936-37 (CCPA 1976); *In re Malagari*, 499 F.2d

1297, 1303, 182 USPQ 549, 553 (CCPA 1974). Such is the case here. Claim 5 of Peterson's application recites and Shah discloses superalloys having the following compositions:

|            | Claim 5          | Shah            |
|------------|------------------|-----------------|
| Rhenium    | about 1-3%       | 0-7%            |
| Chromium   | about 14%        | 3-18%           |
| Cobalt     | about 9.5%       | 0-20%           |
| Tungsten   | about 3.8%       | 0-18%           |
| Tantalum   | about 2%         | 0-15%           |
| Molybdenum | about 1.5%       | 0-4%            |
| Carbon     | about 0.05%      | at least 0.002% |
| Boron      | about 0.004%     | at least 0.002% |
| Aluminum   | about 3-4.8%     | 3-8%            |
| Titanium   | about 4.8% to 3% | 0-5%            |
| Nickel     | balance          | balance         |

[\*\*9]

Clearly, Peterson's application and Shah contain overlapping ranges, as each range listed in Peterson's claim 5 lies within the corresponding range disclosed in Shah. Thus, Shah's ranges encompass Peterson's.

Peterson argues that, despite that overlap, it would not have been prima facie obvious to select the claimed narrower ranges of rhenium and chromium from Shah's broader ranges of those elements. We disagree. In cases involving overlapping ranges, we and our predecessor court have consistently held that even a slight overlap in range establishes a prima facie case of obviousness. E.g., *In re Woodruff*, 919 F.2d at 1578, 16 USPQ2d at 1936-37 (concluding that a claimed invention was rendered obvious by a prior art reference whose disclosed range ("about 1-5%" carbon monoxide) abutted the claimed range ("more than 5% to about 25%" carbon monoxide)); *In re Malagari*, 499 F.2d at 1303, 182 USPQ at 553 (concluding that a claimed invention was rendered prima facie obvious by a prior art reference whose disclosed range (0.020-0.035% carbon) overlapped the claimed range (0.030-0.070% carbon)); see also *In re Geisler*, 116 F.3d at 1469, 43 USPQ2d at 1365 [\*\*10] (acknowledging that a claimed invention was rendered prima facie obvious by a prior art reference whose disclosed range (50-100 Angstroms) overlapped the claimed range (100-600 Angstroms)). We have also held that a prima facie case of obviousness exists when the claimed range and the prior art range do not overlap but are close enough such that one skilled in the art would have expected them to have the same properties. *Titanium Metals Corp. v. Banner*, 778 F.2d 775, 783,

227 USPQ 773, 779 (Fed. Cir. 1985) (concluding that a claim directed to an alloy containing "0.8% nickel, 0.3% molybdenum, up to 0.1% maximum iron, balance titanium" would have been prima facie obvious in view of a reference disclosing alloys containing 0.75% nickel, 0.25% molybdenum, balance titanium and 0.94% nickel, 0.31% molybdenum, balance titanium).

In light of that case law, we conclude that a prima facie case of obviousness was made out in this case. Selecting a narrow range from within a somewhat [\*\*1330] broader range disclosed in a prior art reference is no less obvious than identifying a range that simply overlaps a disclosed range. In fact, when, as here, the claimed ranges [\*\*11] are completely encompassed by the prior art, the conclusion is even more compelling than in cases of mere overlap. The normal desire of scientists or artisans to improve upon what is already generally known provides the motivation to determine where in a disclosed set of percentage ranges is the optimum combination of percentages. See *In re Boesch*, 617 F.2d 272, 276, 205 USPQ 215, 219 (CCPA 1980) ("Discovery of an optimum value of a result effective variable in a known process is ordinarily within the skill of the art." (citations omitted)). n1 We therefore conclude that a prior art reference that discloses a range encompassing a somewhat narrower claimed range is sufficient to establish a prima facie case of obviousness. That is not to say that the claimed composition having a narrower range is unpatentable. Rather, the existence of overlapping or encompassing ranges shifts the burden to the applicant to show that his invention would not have been obvious, as we discuss below. Accordingly, because Shah's ranges encompass Peterson's, we

conclude that the Board did not err in determining that Shah renders Peterson's claimed composition prima facie obvious. n2 [\*\*12]

n1 Although ranges that are not especially broad invite routine experimentation to discover optimum values, rather than require nonobvious invention, we do not have here any assertion that the disclosed range is so broad as to encompass a very large number of possible distinct compositions. We thus do not need to decide whether a disclosed range of such breadth might present a situation analogous to our cases involving the failure of a very broad disclosed genus of substances to render prima facie obvious specific substances within its scope. See, e.g., *In re Baird*, 16 F.3d 380, 29 USPQ2d 1550 (Fed. Cir. 1994); *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992).

n2 Consequently, we need not address the prima facie obviousness arguments based on the Wukusick, Duhl, and Bieber references. We note, however, that those references are less convincing than Shah in creating a prima facie case of obviousness. There is no genuine overlap between Wukusick's disclosed range of 7-12% chromium and Peterson's claimed range of "about 14 percent chromium." Peterson's only mention of an alloy having about 12% chromium is of a test alloy in its comparative Example I; it is not an example of Peterson's invention. Duhl and Bieber do not even mention rhenium, let alone disclose compositions with rhenium.

[\*\*13]

#### B. Rebuttal of the Prima Facie Case

We turn next to Peterson's attempt to rebut the prima facie case of obviousness. In general, an applicant may overcome a prima facie case of obviousness by establishing "that the [claimed] range is critical, generally by showing that the claimed range achieves unexpected results relative to the prior art range." *In re Geisler*, 116 F.3d at 1469-70, 43 USPQ2d at 1365 (alteration in original) (quoting *In re Woodruff*, 919 F.2d at 1578, 16 USPQ2d at 1936). That same standard applies when, as here, the applicant seeks to optimize certain variables by selecting narrow ranges from broader ranges disclosed in the prior art. See *In re Geisler*, 116 F.3d at 1470, 43 USPQ2d at 1365 ("Only if the 'results of optimizing a variable' are 'unexpectedly good' can a patent be obtained for the claimed critical range." (quoting *In re Antonie*, 559 F.2d 618, 620, 195

USPQ 6, 8 (CCPA 1977))); *In re Wertheim*, 541 F.2d 257, 267, 191 USPQ 90, 100 (CCPA 1976) (recognizing that "ranges which overlap or lie inside ranges disclosed by the prior art may be patentable if the applicant [\*\*14] can show criticality in the claimed range by evidence of unexpected results"). Moreover, the applicant's showing of unexpected results must be commensurate in scope with the claimed range. See *In re Greenfield*, 571 F.2d 1185, 1189, 197 USPQ 227, 230 (CCPA 1978) [\*1331] ("Establishing that one (or a small number of) species gives unexpected results is inadequate proof, for 'it is the view of this court that objective evidence of non-obviousness must be commensurate in scope with the claims which the evidence is offered to support.'" (quoting *In re Tiffin*, 58 C.C.P.A. 1420, 448 F.2d 791, 792, 171 USPQ 294, 294 (CCPA 1971))).

We agree with the PTO that substantial evidence supports the Board's finding that Peterson failed to show that the addition of rhenium results in unexpected improvements in alloy strength for the entire claimed range of "about 1 to 3 percent" rhenium. The specification includes several examples of superalloy compositions and their respective strengths, measured by average rupture life. Of most relevance are the following data disclosed in those examples: Example I, which contains no rhenium, resulted in an average rupture life of about [\*\*15] 34 hours. Example II, which includes 1% rhenium, resulted in an average rupture life of about 57 hours. Example III, which contains 2% rhenium, resulted in an average rupture life of about 114 hours.

Although those data show that alloy strength improved with the addition of rhenium, they do not evidence unexpected results for the entire claimed range of about 1-3% rhenium. From the few data points provided, the most significant improvement in stress rupture life occurred with the addition of 2% rhenium. However, the Board's implicit conclusion that the addition of rhenium in the lower portion of the claimed range did not produce unexpected results (i.e., the addition of 1% rhenium increased stress rupture life from 34 hours to only 57 hours) is supported by substantial evidence, and there are no data to show that the addition of rhenium in the uppermost portion of the claimed range (i.e., 3% rhenium) would lead to unexpected results. In fact, the only data that report the stress rupture life of an alloy having 3% rhenium seem to suggest the opposite. In an experiment similar to that demonstrated by Examples I-III, Example IV includes no rhenium and resulted in an average rupture [\*\*16] life of about 148 hours. Example V, which contains 2% rhenium, resulted in an average rupture life of about 275 hours. Example VI, which contains 3% rhenium but less titanium than Examples IV and V, resulted in an average rupture life of only about 130 hours. Thus, the only data for an alloy

containing 3% rhenium actually show a decrease in average rupture life as compared with alloys having 0% or 2% rhenium. Moreover, whether an applicant has shown unexpected results is a question of fact, on which we defer to the Board. We therefore conclude that substantial evidence supports the Board's finding that Peterson has not shown unexpected results that are commensurate in scope with the claimed range of "about 1-3 percent" rhenium.

Alternatively, an applicant may rebut a prima facie case of obviousness by showing that the prior art teaches away from the claimed invention in any material respect. *In re Geisler*, 116 F.3d at 1469, 43 USPQ2d at 1365 (quoting *In re Malagari*, 499 F.2d at 1303, 182 USPQ at 553). Peterson contends that the prior art teaches away from the claimed invention in that Wukusick teaches that the amount of chromium must be reduced [\*\*17] when rhenium is added to a nickel-base superalloy for strength purposes. Peterson also argues that Bieber teaches away from the invention by warning that a high chromium content can have "catastrophic effects" on alloy strength. We agree with the PTO that substantial evidence supports the Board's finding that the prior art does not teach away from the claimed invention. Although the Board [\*1332] did not expressly address "teaching away" in the context of Peterson's attempt to rebut the prima facie case of obviousness, it did find that the Shah, Wukusick, and Bieber references teach the invention and themselves establish prima facie cases of obviousness. Implicitly, then, the Board found that those references do not teach away from Peterson's invention. Certainly the Shah reference, the rejection on which we have affirmed the Board's decision, does not teach away from the invention. While it mentions a preferred alloy that does not contain rhenium, it does not disparage or otherwise discourage the use of alloys containing rhenium. Although Wukusick and Bieber may suggest upper limits on chromium content in order to avoid adverse effects on alloy strength, they disclose alloys containing [\*\*18] as much as 12% and 14% chromium, respectively. Moreover, Wukusick expressly teaches that adding rhenium will improve high-temperature strength. Thus, substantial evidence supports the Board's factual finding that the prior art does not teach away from Peterson's combination of about 1-3% rhenium with about 14% chromium. We thus conclude that the Board did not err in its determination that Peterson failed to rebut the prima facie case of obviousness or in its ultimate conclusion that Peterson's claimed superalloy would have been obvious under § 103.

#### CONCLUSION

Substantial evidence supports the Board's findings that Peterson's claimed element ranges are encompassed by the ranges disclosed in the Shah reference, that

Peterson did not show unexpected results commensurate in scope with the claimed range of rhenium, and that the prior art does not teach away from the claimed invention. Thus, the Board did not err in concluding that claims 1-7 would have been obvious under § 103. Accordingly, the Board's decision is

AFFIRMED.

# EXHIBIT B



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195 U.S.P.Q. (BNA) 6

LEXSEE 559 F.2D 618

IN THE MATTER OF THE APPLICATION OF RONALD L. ANTONIE

Patent Appeal No. 76-681.

UNITED STATES COURT OF CUSTOMS AND PATENT APPEALS

559 F.2d 618; 1977 CCPA LEXIS 118; 195 U.S.P.Q. (BNA) 6

AUGUST 18, 1977, Decided

**PRIOR HISTORY: [\*\*1]**

Serial No. 331, 796.

**COUNSEL:**

Arthur H. Seidel, Thomas W. Ehrmann, Milwaukee, Wis. (Quarles & Brady, Milwaukee, Wis.), attorneys of record, for appellant.

Joseph F. Nakamura, Washington, D.C. for the Commissioner of Patents, R. D. Edmonds, Washington, D.C., of counsel.

**OPINIONBY:**

BALDWIN

**OPINION: [\*618]**

BALDWIN, Judge.

This is an appeal from a decision of the Patent and Trademark Office (PTO) Board of Appeals (board) affirming the rejection of claims 1, 2 and 3 of an application for "Rotating Biological Contactor Apparatus" n1/ as obvious under 35 USC 103 in view of El-Naggar. n2/ We reverse.

n1/ Serial No. 331, 796, filed February 12, 1973.

n2/ "Method of Treatment of Sewage by Bio-Oxidation and Apparatus Therefor," U.S. Patent No. 3,335,081, issued August 8, 1967.

**The Invention**

Appellant claims a wastewater treatment device in which wastewater is continuously passed through a tank. Semiimmersed contactors (disks) are continuously rotated to aerate their immersed portions and thereby to aerate both microorganisms that grow on the contactors

and the wastewater itself. For this discussion, several variables are important in this device. "Throughput" is the volume [\*\*2] of wastewater per unit time (gal/day) which the device must treat. "Contactor area" is the total area of the contactors which is exposed to the wastewater as the contactors are rotated (sq. ft.). "Tank volume" is the actual volume of liquid in the tanks in which the contactors [\*619] rotate (gal.). The ratio of throughput to contactor area (gal./day/sq. ft.) is called the "hydraulic loading." Two concepts of effectiveness of the equipment are important in this discussion. The primary prior art reference uses the term "efficiency" to denote the percent impurity reduction which a given set-up of the device achieves and we shall so use the term. Appellant uses the term "maximum treatment capacity" to denote when a unit of contactor area is providing maximum "efficiency" for a given "throughput" or maximum "throughput" for a given "efficiency." It is essential to understand the distinction between "efficiency," a matter of ultimate effectiveness independent of the efficiency of the equipment, and "treatment capacity," a matter of the efficiency or effectiveness of a unit of contactor area. The latter is more properly associated with the normal use of the term "efficiency" denoting [\*\*3] maximum result from a limited resource.

Appellant's claimed device has a ratio of tank volume to contactor area of 0.12 gal./sq. ft. n3/ Appellant maintains that this ratio is the most desirable or optimum for all set-ups of the device in the sense that using a lower value gives lower "treatment capacity" and using a greater value gives no increase in "treatment capacity," merely increasing costs. Thus, the value is optimum in that it maximizes "treatment capacity" so that the effectiveness of a given contactor is maximized.

n3/ Claims 1 and 2 recite "at least about 0.12" while claim 3 recites "about 0.12."

**The Prior Art**

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El-Naggar teaches the basic structure of the device claimed by appellant but is silent regarding quantitative design parameters other than to give data on a single example, which data was apparently complete except for any discussion of "tank volume." El-Naggar stated the "efficiency" (obviously referring to the purity of the output) could be increased to 95% by increasing the area of the contactor.

#### The Rejection

The examiner rejected the claims as obvious under 35 USC 103, noting that the basic device in question is old as taught by El-Naggar. [\*\*4] While the ratio of tank volume to contactor area of 0.12 gal./sq. ft. is not disclosed in El-Naggar, the examiner reasoned that the disclosure of El-Naggar would make a device with that optimum value obvious. The examiner noted that El-Naggar suggests increasing the "efficiency" (degree of purification) of his device by increasing the contactor area while apparently keeping the "throughput" constant, that is, reducing the "hydraulic loading." The examiner then assumed that El-Naggar teaches keeping the tank volume constant while increasing the contactor area. Thus, the examiner argued that the idea of increasing tank volume to surface area to increase efficiency is taught and that working out the value for optimum efficiency is mere mechanical experimentation. The board accepted the examiner's reasoning.

#### OPINION

In determining whether the invention as a whole would have been obvious under 35 USC 103, we must first delineate the invention as a whole. In delineating the invention as a whole, we look not only to the subject matter which is literally recited in the claim in question (the ratio value) but also to those properties of the subject matter which are inherent in the subject [\*\*5] matter and are disclosed in the specification. *In re Davies*, 475 F.2d 667, 177 USPQ 381 (CCPA 1973). In this case, the invention as a whole is the ratio value of 0.12 and its inherent and disclosed property. That property is that the described devices designed with the ratio will maximize treatment capacity regardless of the values of the other variables in the devices. Just as we look to a chemical and its properties when we examine the obviousness of a composition of matter claim, it is this invention as a whole, and not some part of it, which must be obvious under 35 USC 103. Cf. *In re Papesch*, 50 CCPA 1276, 315 F.2d 381, 137 USPQ 43 (1963). [\*\*620]

The controlling question is simply whether the differences (namely the value of 0.12 and its property) between the prior art and appellant's invention as a whole are such that appellant's invention as a whole would have been obvious. The answer is no. It is impossible to

recognize, from the experiment taught by El-Naggar, that "treatment capacity" is a function of "tank volume" or the tank volume-to-contactor area ratio. Recognition of this functionality is essential to the obviousness of conducting experiments to determine [\*\*6] the value of the "tank volume" ratio which will maximize treatment capacity. Such functionality can only be determined from data representing either efficiency at varying tank volume, fixed throughput, and fixed contactor area or throughput at varying tank volume, fixed efficiency, and fixed contactor area. Each of these experiments represents treatment capacity with fixed contactor area but varying tank volume. This sort of experiment would not be suggested by the teachings of El-Naggar since he was not trying to maximize or control "treatment capacity." The experiments suggested by El-Naggar do not reveal the property which applicant has discovered, and the PTO has provided us with no other basis for the obviousness of the necessary experiments.

The PTO and the minority appear to argue that it would always be obvious for one of ordinary skill in the art to try varying every parameter of a system in order to optimize the effectiveness of the system even if there is no evidence in the record that the prior art recognized that particular parameter affected the result. n4/ As we have said many times, obvious to try is not the standard of 35 USC 103. *In re Tomlinson*, 53 CCPA 1421, [\*\*7] 363 F.2d 928, 150 USPQ 623 (1966). Disregard for the unobviousness of the results of "obvious to try" experiments disregards the "invention as a whole" concept of § 103, *In re Dien*, 54 CCPA 1027, 371 F.2d 886, 152 USPQ 550 (1967) and *In re Wiggins*, 55 CCPA 1356, 397 F.2d 356, 158 USPQ 199 (1968), and overemphasis on the routine nature of the data gathering required to arrive at appellant's discovery, after its existence became expected, overlooks the last sentence of § 103. *In re Saether*, 492 F.2d 849, 181 USPQ 36 (CCPA 1974).

n4/ The precise nature of the El-Naggar experiment and the nature of the data which would result are rendered hopelessly speculative by El-Naggar's total failure to discuss the critical matter of what is done with the volume of the tank. The PTO appears to assume, as a necessary element of its conclusion, that appellant's ratio is the inevitable result of El-Naggar experiment, and that the tank volume is fixed, apparently because El-Naggar does not suggest changing the tank as additional contactor area is supplied. Even if the same tank were used, the actual liquid volume of the tank could change significantly if 1) the tank has a level control, 2) the tank is not extremely large in comparison to the contactors

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and 3) the volume-to-area ratio of the contactors themselves is significant. Since these assumptions are not unreasonable, there is serious doubt as to the constant volume of the tank.

Whether one would inevitably arrive at the ratio value of 0.12 or above depends on facts which must be read into El-Naggar, (e.g., the volume of the tank) and on assumptions about the kind of motivation (e.g., the degree of "efficiency" which would be sought). All of this involves, at least on this record, mere speculation. Assuming, as the examiner has, that the tank volume is fixed and the natural motivation is to maximize efficiency, if El-Naggar's equipment has a tank volume to contactor area ratio of less than 0.12, and the resulting efficiency is found wanting, increasing the contactor area to increase "efficiency" will lead away from the claimed ratio.

[\*\*8]

In *In re Aller*, 42 CCPA 824, 220 F.2d 454, 105 USPQ 233 (1955), the court set out the rule that the discovery of an optimum value of a variable in a known process is normally obvious. We have found exceptions to this rule in cases where the results of optimizing a variable, which was known to be result effective, were unexpectedly good. *In re Waymouth*, 499 F.2d 1273, 182 USPQ 290 (CCPA 1974); *In re Saether*, *supra*. This case, in which the parameter optimized was not recognized to be a result-effective variable, is another exception. The decision of the board is reversed.

REVERSED

MILLER, J., concurs in the result.

DISSENTBY:

MALETZ

DISSENT: [\*621]

MALETZ, Judge, \*/ dissenting, with whom RICH, Judge, joins.

al/ Judge of the United States Customs  
Court sitting by designation pursuant to 28 USC  
293(d).

With all due respect, I cannot agree with the majority's interpretation of the El-Naggar patent. El-Naggar discloses the same wastewater treatment apparatus as claimed, except for the specific volume-to-surface ratio of .12 gallons per square foot as recited in the claims. However, El-Naggar generally discloses varying the number of disks (column 3, lines 31-35), the

number [\*\*9] of concentric cylinders (column 4, lines 27-30), or the length of the cylinders (column 4, lines 61-62) in his apparatus in order to optimize results. Given the basic apparatus of El-Naggar and the concept of varying the number of disks in a tank in order to optimize impurity removal, I believe that it would have been well within the capabilities of the chemical engineer of ordinary skill to determine empirically, by routine experimentation, the optimum design ratio which appellant has determined and recited in his claims. That is, El-Naggar set the way, and appellant's work was what any routineer would have accomplished in following the patent teachings.

Appellant urges that the results which he determined empirically by plotting the effect of volume-to-surface ratio on impurity removal, including the specific, optimum design ratio of .12 gallons per square foot, could not have been predicted from El-Naggar. However, obviousness under 35 USC 103 does not require absolute predictability, *In re Kronig*, 539 F.2d 1300, 190 USPQ 425 (CCPA 1976), and it is sufficient here that El-Naggar clearly led the way for the routineer to arrive at the claimed apparatus.

I am in substantial [\*\*10] agreement with the board's analysis of this case, and I would affirm the board's decision.